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14. ABSTRACT
The long-term goal of this effort is to develop scalable, physically based parameterizations for lateral mixing in the stratified ocean on scales of 0.1-10km that can be implemented in larger-scale ocean models. These parameterizations will incorporate the effects of local ambient conditions including latitude, mean stratification and mesoscale flows. Another ultimate goal is to develop a more comprehensive picture of horizontal and vertical mixing processes in the ocean.

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"LES Modeling of Lateral Dispersion in the Ocean On Scales of 10 m to 10 km"

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ANNUAL REPORT FOR THE PERIOD OF PERFORMANCE FROM 01/07/10-01/06/11

LONG-TERM GOALS:

The long-term goal of this effort is to develop scalable, physically based parameterizations for lateral mixing in the stratified ocean on scales of 0.1-10 km that can be implemented in larger-scale ocean models. These parameterizations will incorporate the effects of local ambient conditions including latitude, mean stratification and mesoscale flows. Another ultimate goal is to develop a more comprehensive picture of horizontal and vertical mixing processes in the ocean stratified interior.

OBJECTIVES:

The objectives are to work collaboratively with modelers and observationalists involved in the LatMix DRI. My participation in LatMix focuses on understand the relationship between internal-wave breaking, episodic diapycnal mixing and lateral dispersion on scales of 0.1-10km.

APPROACH:

The first objective involves attending meetings and actively participating in discussions pertaining to the DRI. The second objective is addressed with process-oriented numerical simulations, with close collaboration with observationalists Eric Kunze, Tom Sanford and his graduate student Nate Lauffenburger. The primary numerical tool used for the simulations is a highly optimized Boussinesq model that has been extensively used by the PI to study internal-wave and dispersion-related problems.

WORK PERFORMED DURING THIS QUARTER:

My focus during this quarter was on performing simulations of lateral stirring in fields of internal waves initialized with a Garrett-Munk (GM) spectrum. Specifically, internal wave fields were initialized and the frequency of breaking events, diagnosed with a simple Richardson number criterion, was recorded. Most of the energy in a GM spectrum resides in the near-inertial wave band. Previous studies have demonstrated that these waves break via shear instability (Lelong and Dunkerton, 1998ab). Therefore, using the threshold value of 0.25 for the local Richardson number, to signal wave breaking is justified. The horizontally averaged vertical distribution of internal wave energy at t=0 is shown in Figure 1. Vertical cross-sections of the velocity and density fields are shown in Figure 2. As seen in Figure 3, the local Richardson number falls below 0.25, on average, 13% of the time.